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USSR Report

AGRICULTURE

(FOUO 4/80)

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CONTENTS

PAGE

LIVESTOCK

Poster Describes Ural Sovkhoz Meat Production
(N. V. Cherekayev; ZOOTEKHNICHESKIYE I VETERINARNYYE SOVETY KOLKHOZAM I SOVKHOZAM, Dec 78) 1

Orlovskaya Oblast's Mtsensk Farm Progress Described
(I. P. Kutuzov; ZOOTEKHNICHESKIYE I VETERINARNYYE SOVETY KOLKHOZAM I SOVKHOZAM, Mar 79) 8

REGIONAL DEVELOPMENT

Snow Cover Studies for Reclamation Purposes Using Landscape Method
(K. V. Pashkang, V. A. Shkalikov; VESTNIK MOSKOVSKOGO UNIVERSITETA, Jan-Feb 80) 15

LIVESTOCK

POSTER DESCRIBES URAL SOVKHOZ MEAT PRODUCTION

Moscow ZOOTEKHNICHESKIYE I VETERINARNYYE SOVETY KOLKHOZAM I SOVKHOZAM in Russian No 23, Dec 1978, signed to press 30 Oct 78

[Article by N.V. Cherekayev (newspaper poster of the USSR Ministry of Agriculture): "Intrafarm Specialization in Meat Cattle-raising, Experience of the Sovkhoz imeni Gazeta 'Pravda' of Ural'skaya Oblast"]

[Text] "For radical solution of the problem of beef production it is necessary more energetically to conduct the work for creation of an independent sector of specialized meat cattle-raising."

From the report of comrade L.I. Brezhnev to the July 1978 Plenum of the CPSU Central Committee

The Sovkhoz imeni Gazeta "Pravda" of Dzhambeytinskiy Rayon is located in a semi-arid zone, where on the average there are 240 millimeters of precipitation per year. The area of agricultural lands comes to 109,800 hectares, and out of this there are 38,200 hectares of plowed field and 71,600 hectares of pasture lands and haymows. In recent years the sovkhoz has sold to the state about 35,000-40,000 tons of grain, more than 2,000 tons of meat, and over 90 percent of it is produced owing to its own fodders and animals.

Up to the end of the sixties animal husbandry in the sovkhoz was developed according to the multisector principle. In 1967 it began to specialize in the breeding, raising and fattening of cattle of the Kazakh whiteheaded breed. Intrafarm specialization was started in 1970-1971. Three departments started to engage in reproduction of young calves, and one in the raising and fattening of young bulls (after weaning) on an industrial basis. Events have confirmed the correctness of such a decision. Whereas in 1966 there were 3,500 head of cattle, in 1978 there were 12,000 (among these, 4,000 cows). Production of meat of all types, including poultry, increased 4.0-fold in 1977 as compared with 1966, and the production of beef increased 9.3-fold (chart).

Average Annual Production of Meat on the Farm (tons)

Years	Total production of Meat	Production of beef
1966	59529	218
1966-1970	854	543
1971-1975	1490	1344
1977	2206	2033

On the farm, animal husbandry is a highly profitable sector even in dry years. Since 1973 the profit from the sale of beef cattle comes to 0.8-1.5 million rubles per year.

Reproducer Farms

Technology. In the winter the cows and the replacement young are kept in facilities of the light-duty type. The standard ration for female stock in the stall period consists of 3 kilograms of hay, 10-12 kilograms of straw and 15 kilograms of silage (as a rule, concentrates are not given to the cows). With such a feeding regime during the winter the live weight of the cows is reduced by 40-60 kilograms. But during pasturing of the animals this is quickly restored and therefore there are no negative consequences either for the cows or for the future offspring. In the summer cows with calves are kept on natural pasture lands without supplementary feeding.

Reproduction of the Herd and Raising Calves. Artificial insemination is used for three-fourths of the breeder cows. This is done from 20 May through 30 July, when the cows are well-fattened. For this purpose, races are built at the pastures with a mechanical fixer (one race for 1-2 bands), which make it possible for the cowman alone or with an assistant to separate and fix the cows in estrus. Twice a day the insemination technician makes the rounds in a passenger vehicle (on a circular route) of all the races and inseminates the culled animals with sperm taken at the Ural'skaya State Breeding Station. In some cases, where there are no access roads, the cows are serviced manually.

Seasonal calving. About 90 percent of the yearly offspring are produced in March-April. By weaning the live weight of such young is 10-15 percent greater than the calves from summer and fall calvings, and their mothers are in estrus sooner in the pasture. Winter calvings are also undesirable. During these the expenditure of fodder increases and there are often cases of barrenness.

Work Results of Fattening Complex

Indicators	Years*		
	1973	1975	1977
Number of livestock places	2000	3500	5000
Supplied for fattening, head	2050	4044	4928
Average live weight of animal when set up for fattening, kilograms	190	200	200
Removed from fattening, head	1743	2648	3450
Average live weight of animal when removed from fattening, kilograms	507	489	505
Outlays of fodder per quintal of weight gain, quintals of fodder units	11.9	9.9	8.4
Outlays of labor per quintal of weight gain, man-hours	15.5	12.1	7.7
Prime cost of a quintal of weight gain, rubles	94.7	103.3	93.9
Profit from sales, thous. rubles	852	797	1425

*The complex was built in phases.

The system of reproduction of the herd and maintenance of the female breeding stock used on the farm has generated a high yield and a low cost of the calves. In 1977 95 calves were produced from every 100 cows and heifers. The foremost workers annually attain a 96-100 percent yield of young stock. Its prime cost is going down: in 1975 upon the birth of a calf it was 67.5 rubles, and in 1977 52.5 rubles, and during weaning the cost was 215.9 and 168.1 rubles respectively.

At the present time the management and specialists of the farm are working on the task of converting to the intensive method of raising replacement calves, so that it will be possible to inseminate them at the age of 15-16 months. For this purpose at the Ankatinskiy Breeding Farm, which has the same conditions as at the sovkhoz and is located on a neighboring territory, a study has been made of the effectiveness of pasture fattening of calves until weaning and of replacement calves at the age of 12-16 months (before insemination).

Experience has shown that with a norm of 10-12 hectares of natural pastures based on a cow with a calf, additional fattening of calves is not expedient. The advantage in live weight among the experimental young stock (13 kilograms) in comparison with the control stock (not fattened up) during subsequent raising of these and the others under identical conditions disappeared. At the same time additional feeding of the replacement calves proved effective: this made it possible to inseminate them 1.5-3.5 months earlier.

Labor Organization and Wages. The basic production unit at a reproducer farm is the band, with 120-140 cows with calves. It is serviced by a team of 2-3 people. The average norm of the load per worker is 62 cows with calves--46 in the winter and 74 in the summer. The labor of the team members is remunerated as follows. In the first six months after mass calvings of the cows they receive a bonus for output: on the average, 18 rubles per quintal of weight gain. In addition, for each calf during weaning they are paid .6 more rubles. In the next six months, when the majority of the cows are dry, the members of the team earn for servicing the stock on the basis of 2.7 rubles per cow.

The average monthly wage of a worker in the winter is 140 rubles, and in the summer 230 rubles. In-kind payments are used as an additional incentive: in the case of preservation of 99 percent of the adult stock and obtaining from 85-90 calves calculating per 100 cows the payment is two kilograms of meat, for from 91-95 it is three, and for more than 95 calves it is five kilograms for each calf raised above 85 and which has reached a live weight of 180 kilograms upon weaning.

Fattening Complex

Design and Construction Decisions. The complex, intended for 5,000 livestock places, includes: 10 brick facilities 18X80 meters in size (for 500 head each), an open summer site for keeping the young stock, a feed shop, boiler room, a veterinary and sanitation center for 50 people, a section for sick animals (30 places), auxiliary and storage buildings, silage pits a center for receiving and shipping livestock, and a site for processing it. The total estimated cost of the complex is 2.25 million rubles, and the cost of a livestock-place is 450 rubles.

The accomodations for livestock are partitioned into three sections. In the center is the feed passage with a hard covering, along both sides of which feeding troughs have been installed. Each section has an independent exit to the exercise and feed yard.

Technology. The fattening head are filled out with healthy castrated bulls and above-replacement calves seven and eight months old. This stock is kept on deep litter in groups of 150-200 head. For each animal there are 8 square meters of useful area, and out of this 3 are in the facility and five in the exercise and feed yard. In the summer the young are transferred to an open site, divided according to the number of sections into pens and equipped with feed troughs and waterers.

Manure is taken out by bulldozer, once a year at the exercise and feed yards and twice in the buildings. In the winter and fall the young are fed from stationary concrete feed troughs in the exercise and feed yards and only in very bad weather are they fed in the buildings. The feed is dispensed by mobile feed dispensers.

The technological cycle of fattening is divided into three phases. The first (raising) continues on the average for 120 days, until the livestock reaches a live weight of 250 kilograms, the second (preparatory) lasts 120-150 days, up to 330-360 kilograms, and the third (concluding fattening) lasts 60-100 days. They animals are turned in for meat when they have a marked decrease in growth energy, usually when they reach a live weight of 450 kilograms.

In the first two phases the young stock is fed with silage, hay, concentrates with molasses, and in the last they are given concentrates and hay in any amount. The fodder is enriched with mineral and vitamin additives. The proportion of concentrates (according to food value) in the ration comes to: in the raising phase, 17 percent; in the preparatory 25-30 percent; in the concluding phases 70-80 percent; and for the whole production cycle, 40-50 percent. Transfer of the livestock to concluding fattening is accomplished gradually, in the course of 7-10 days. All the fodder, with the exception of molasses and the mineral additives, is produced in our own farm.

In the summer green mass is introduced into the rations, partially replacing hay and silage with it. Straw occupies a large place in the winter ration of fattening livestock. The straw is ground, and in the feed shop, where three calcinators have been installed with a total capacity of 41 cubic meters, it is wet with an alkaline solution (30 kilograms of soda ash and 15 of table salt per 800 liters of water). After this for 4-5 hours the straw is treated with steam, and then seasoned with concentrates. The prepared fodder acquires a "grain" odor and is easily eaten up by the animals. The nutritive value of the straw is increased 1.5-2-fold.

The majority of the animals in the last period of fattening in the winter do not go into the buildings even at night and during severe frosts (up to -35 degrees). Consequently, under the conditions of Ural'skaya Oblast it is possible to use open yards for the final fattening.

Economic Effectiveness. Intrafarm specialization and fattening of livestock on an industrial basis have made it possible to eliminate the fattening of livestock on pasture lands which is inefficient for the grain zone, and to attain stable production of beef (see table).

Labor productivity has increased. Whereas prior to organization of the complex a fattening band of 150-180 head was serviced by three cattlemen, now there is only one operator. The outlays of labor per quintal of weight gain in the Eighth Five-Year Plan came to 33 man-hours on the average, but in 1977 they were reduced to 19 for the sovkhoz and to 7.7 man-hours for the complex. In the structure of the prime cost of beef the expenditures for wages during this period were reduced from 33 to 10-12 percent.

Labor Organization and Wages. All the fattening head of cattle are served by two teams, specialized in phases of fattening: 10 people for raising and preparation for fattening, and 8 people for fattening. In order to increase the responsibility of the workers for the whole technological cycle, after completion of the phase of raising and preparation each team transfers to fattening, and vice versa. Assigned to the teams are seven MTZ-50 tractors, six KTU-10 feed dispensers and two of the KTU-3A brand, two clamshell-loaders, two workhorses, and three-four tractor trailers.

Working at the complex are 36 people, with 26 of these basic workers (among them are also workers in the feed shop). Management of the technological process is the responsibility of the chief of the complex, who distributes the fodder among the teams, supervises the weighing of the livestock, does the accounting and reporting together with the zootechnician, and performs all the organizational work. The team leaders are subordinate to him.

The working day of the team is organized in one 7-hour shift. The duties of its members include the following jobs: dispensing fodder, ins ection of the animals, cleaning of the feed troughs, separation of weak and sick animals and care for them (they are kept in special sections), removal of manure, and minor repairs of buildings and equipment. In processes connected with use and minor repairs of vehicles, they are assisted by an electrician and a welder. The basic medical and preventive care work is performed by two veterinarians and two attendants. Two veterinary workers from the department are enlisted when mass veterinary medicine preventive measures are conducted.

At the complex, true masters of their work have emerged. These are team leaders A.Ye. Lyayman, who was awarded the Order of Labor Red Banner, and K. Kaliyev, and animal breeder-foremen V.Yu. Mayzel', A.R. Mikheylis and U. Zhusubaliyev.

Wages are paid on a piece-work plus bonus system. Per quintal of weight gain the team is paid 8.86 rubles for raising and preparation for fattening, and 5.31 rubles for fattening. Payment for skills level (category) is used, and a system of material incentives is in effect. For each percent of overfulfillment of the plan for producing gross output the team members are paid a bonus amounting to one percent of the basic salary. In addition, they are given in kind 15 percent of the above-plan increase under the condition of 100-percent preservation of the herd. The average wage of workers in the complex comes to 250 rubles per month.

Fodder Base

The successes of the animal breeders in the sovkhoz have become possible thanks to strengthening of the fodder base. Beginning with 1954 at the farm 40,000 hectares of virgin lands have been developed. As a result of the use of advanced agricultural technology, the yield capacity of

grain crops is being increased. Whereas in 1953 here they grew 4.7 quintals of grain per hectare, in the years of the Eighth Five-Year Plan the figure was 11.7, and in 1976 15.6 quintals. This has made it possible to provide animal husbandry with its own concentrated fodders.

In addition, 14,000 hectares of unproductive natural haymows and pastures were subjected to radical improvement, and on these lands they began to raise wheat grass and alfalfa. During the Ninth Five-Year Plan the yield of wheat grass hay came to 7.5 quintals per hectare on the average, while not more than 3-4 quintals of it was obtained from natural haymows. Plantings of corn for silage were increased to 4,000 hectares. The yield of green mass comes to 80 quintals on the average.

The sovkhoz animal breeders and machine operators devote especial attention to the quality of the hay. Perennial grasses are mowed with re-equipped grain combines in paired cuttings with subsequent reaping by pick-up balers. This method has shown its merit under the conditions of the farm: it insures cleanlinesss of the fodder and high conservation of the nutrients in it.

Every year the farm procures on the average 16,000-20,000 tons of fodder units, and of this amount there are 4,000 tons of hay and 7,000-8,000 tons of silage fodder units. There are 16-18 quintals of fodder units per standard head of livestock. However in especially dry years the gross harvest of fodders can be reduced by half. Therefore in the sovkhoz they have prepared areas of irrigated lands which will be used basically for raising corn. This will make it possible to have a guaranteed reserve of fodder, which will increase the stability of beef production.

10908
CSO: 1824

LIVESTOCK

ORLOVSKAYA OBLAST'S MTSENSK FARM PROGRESS DESCRIBED

Moscow ZOOTEKHNICHESKIYE I VETERINARNYYE SOVETY KOLKHOZAM I SOVKHOZAM in Russian No 10, May 1979, signed to press 18 Apr 79

[Article by I.P. Kutuzov (newspaper poster of the USSR Ministry of Agriculture): "For a High Weight Gain With the Least Outlays (Experience of the Mtsensk Interfarm Enterprise in Orlovskaya Oblast)"]

[Text] The Mtsensk Interfarm Enterprise was formed in 1972. It specializes in the final fattening of young cattle which are supplied by kolkhozes and sovkhozes from 14 rayons in the oblast.

The production capacities have been developed over the course of four years, and during this time the number of livestock-places rose from 2,500 to 12,000. In the summer when the exercise yards are in use there are 17,000 animals for fattening at once.

The enterprise collective has achieved considerable successes (table 1). From 1972 to 1977 the average daily increase in live weight of livestock for fatting in terms of one animal was increased by 20 percent, and at the time of sale the animals were 25 kilograms heavier (6.5 percent more).

The prime cost of a quintal of live weight was reduced from 133 to 128 rubles, and the average price of the sale of it rose from 221 to 236 rubles. The profit in terms of one bull sold in the first year of the enterprise's operation came to 340 rubles, in 1977 it was 437 rubles, and per livestock place the figures were 156 and 1,246 rubles respectively.

Intensification of fattening has made it possible to shorten the duration of the technological process and to increase the yield of production capacities. Whereas in 1972 1.4 quintals of output was produced in terms of a livestock-place, in 1977 it was 3.4 quintals, and the coefficient of use of a livestock-place reached 2.8.

Table 1. Basic Production-Economic Indicators of the Enterprise's Operation

Indicator	1972	1977
Livestock fattened and sold to the state, thousand head	1.1	34.2
Sold livestock of the best finish, %	82.7	94.5
Increase in live weight produced, thous. tons	0.4	4.1
Average daily weight gain of one animal, grams	836	1004
Average live weight of one animal at time of sale, kilograms	382	407
Outlays per 1 quintal of weight gain:		
fodders, quintals of fodder units	7.6	7.1
labor, man-hours	7.7	3.7
Prime cost of 1 quintal of weight gain, rubles	86	91.2
Profit made, thous. rubles	390	14950
Profit distributed among participating farms, thous. rubles	340	14805

The work experience of the interfarm enterprise has shown that in-depth specialization and concentration of the sector on the basis of modern equipment and technology open up the prospects for a further increase in production and decrease in the cost of output.

Fattening Technology

The participating farms in the cooperative deliver the livestock to the fattening enterprise in accordance with a contract using their own specially equipped motor transport. Here the animals are carefully inspected and weighed. The head selected are sorted according to live weight and after the appropriate veterinary and sanitation treatment they are placed in sectional accomodations. There are 16 of these, eight each 18 X 76 and 18 X 160 in size, with a capacity of 350-400 and 1,150 head each, respectively.

In order to insure smoothness of production, the placement of animals on the fattening regime and removal from it are performed in such a way that each building is freed and newly occupied in the course of 2-5 days. Approximately 100 head are shipped to the meat combine daily.

The cattle are kept unchained, with 29 head in a section. There are 2 square meters of area and 50 centimeters of feeding frontage for one animal. The microclimate in the buildings is supported by the "mikroklimat-47" ventilation system. This system includes electric heaters for heating the influent air during the cold time of year.

Dispensing of fodder and removal of manure are mechanized. Mobile feed dispensers are used in the fattening yards of the first phase,

intended for 350-400 animals. In the buildings of the second phase, the capacity of which is more than 1,000 head, fodder is delivered by conveyor transporters from the feed mixing shop and then using platform dispensers it is distributed among the feed troughs.

Manure is removed using a hydro-floating method. It is delivered to the dung yard through the slotted floors and reinforced concrete channels with a cross section of 1 X 1 meter and left to stand. The liquid fraction is pumped out to the irrigated lands, and the thick fraction is carried out to the fields after biothermal disinfection.

The livestock is fed basically with inexpensive wastes of the sugar industry--with bagasse and molasses, and also with green and coarse fodders. The rations are standardized in accordance with the live weight and the planned weight gain of the young stock. They provide the need not only for fodder units, but also for digestible protein, mineral substances and vitamins.

Fattening is begun with a 10 day preparatory period. During this time the animals get accustomed to eating bagasse. Then the norm of it is gradually increased to 40-50 kilograms per day. The ration includes a kilogram each of coarse fodders and molasses in order to maintain in the livestock normal digestion and good eatability of the basic fodder. In the course of the whole fattening period concentrates are expended on the average at the rate of up to 3 kilograms daily.

The typical ration during bagasse fattening is poor in phosphorus, trace elements, and vitamins A and D. Mineral and vitamin additives are used in order to make up for the deficiency in these. The enterprise specialists consider fodder diammonium phosphate to be the best source of phosphorus. It contains up to 23 percent of the necessary element and, in addition, not less than 20 percent active substance with respect to nitrogen, which is necessary for building protein substances.

In order to satisfy the need of the animals for mineral substances, the ration includes 100-120 grams of diammonium phosphate and trace additives: 7 milligrams of cobaltous chloride, 50 milligrams of copper sulfate, 400 milligrams of manganese and 240 milligrams of zinc sulfate. These are fed in a mixture with the concentrates and bagasse. Concentrated oil emulsion of vitamin A and vitamin D extract are used as sources of the deficient vitamins.

Labor Organization and Wages

The management and specialists of the interfarm enterprise attach great importance to improvement of labor organization and increasing the material incentives for the workers. Labor has become more efficient and effective in all sectors of production.

The basic production unit is the brigade. There are three of them with 18-26 people each, including 12-17 operators for fattening. In 1977 the average load per one worker in the brigade was 383 animals, and per operator 575 animals. The duties of the workers are strictly defined. This makes it possible better to organize the production of output, more effectively to use fodder and equipment, and to improve occupational skills.

Payment for labor is established in relation to the volume of output produced and the economic effectiveness of production. The salary of the service personnel is made up of three parts: payments in accordance with the rate and skills category, additional payments for output, and bonuses.

A category is given to each worker taking into account the practical skills, experience and length of service, and attitudes toward labor. A special commission conducts the certification. Payment according to wage rate determines the time-rate share of the wage for actually worked time.

Adiitional payment for output is computed in proportion to the norms of the number of head and the amount of weightgain produced. It is an incentive for increasing the production of meat.

Bonuses are given for attaining high indicators for quality of fattening (expressed in the selling price of a quintal of live weight of the livestock) and for the average daily weight gain of an animal (table 2).

Table 2. Scale of the Size of Bonuses for Workers in Basic Production

Selling price of 1 quintal live weight of livestock, rub.	Bonus, % of 2 first parts of salary	Average daily increase in live weight of animal, grams	Bonus, % of 2 first parts of salary
211-215	2	900	3
216-219	5	920	5
220-224	8	940	7
225-229	10	960	10
230-234	12	980	13
235 and higher	15	1000	15

The sum of the award is computed for all members of the brigade after the fattening cycle (100-150 days depending on the set live weight of the young stock) and is distributed among them according to a point system. It includes the following items:

Observance of technological discipline, guarantee of smooth and uninterrupted operation of mechanisms and assemblies;

Observance of labor discipline, rules of internal routine, fulfillment of orders, of assignments;

Maintenance of work places and service zones in the proper sanitary and technical condition.

In order to receive the full sum of the award, it is necessary to acquire 15 points per month. If there are fewer, the award is reduced correspondingly (based on the sum applied to one point). The point system was introduced for the most complete and objective evaluation of the work. The average wage of an operator is 170-180 rubles per month.

Economic Interrelations

The success of organization of production based on the principles of interfarm cooperation greatly depends on how correctly the economic and legal relations between the participating farms and the enterprise uniting them are set up.

The kolkhozes and sovkhozes which supply the livestock annually conclude contracts with the interfarm enterprise. Determined in these are the conditions of receipt of animals for fattening, the procedure for settlements, and the obligations and responsibility of both parties.

According to the contract the participating farms should supply bulls to the inter-farm enterprise with a live weight of not less than 250 kilograms and fodder based on 24 quintals of fodder units per livestock-place. The interfarm enterprise, in turn, takes on the following obligations:

To fatten the animals until they reach the live weight of 400 kilograms and more with an average daily increase of not less than 1,000 grams;

To sell the fattened head to the state to the credit of fulfillment of the plan for state purchases by the enterprise's participating farms, including 93 percent of the cattle at the highest fatness;

To distribute the profit in the amount of 97 percent among the kolkhozes and sovkhozes supplying young stock for fattening, and to allot 3 percent to the economic incentive funds of the enterprise.

How does the interfarm enterprise settle accounts with the participating farms in the cooperative?

When placing the livestock for fattening, for a quintal of live weight of each animal weighing 250 kilograms the farm receives 200 rubles (accounting price), and for 300 kilograms and more it receives an additional 20 percent of the accounting price. If it is considered that for production of a quintal of live weight the kolkhozes of the oblast spend on the average

about 190 rubles, the interfarm enterprise not only compensates these costs, but also creates a share of savings for the farm.

Settlements for fodder are made according to the purchase prices. The distant farms supply forage grain to the grain-receiving centers in exchange for mixed feed, which then is received by the interfarm enterprise according to the authorization of these farms. Upon fulfillment of the supply norm they are given an incentive from the profit: 50 percent of the purchase price of the concentrates.

The enterprise obtains bagasse from the sugar refinery according to the authorizations of the participating farms. The green and coarse fodders are supplied by to kolkhozes (base farms) specialized in their cultivation according to accounting prices, which insure profitability of production.

If the norm of fodder calculated per livestock-place envisaged in the contract is delivered, credited to the kolkhozes and sovkhozes supplying the livestock is 3 quintals of increase in live weight, and to the base farms one quintal for the number of fodder units expended per quintal of weight gain.

The whole increase in the live weight of the livestock is credited to the farms in proportion to the amount of fodder supplied to the interfarm enterprise to the credit of the plan for state purchases of meat according to the degree of sale of the animals to the meat combine.

Taken into account when distributing the profit are all the monetary and physical means invested by the kolkhozes and sovkhozes in the interfarm enterprise: the share participation, the number and quality of livestock and fodder. The 97 percent of this which goes to the participating farms is distributed as follows: 35 percent is payment according to the accounting prices of the livestock supplied for fattening, 5 percent to the base kokhhozes for great and coarse fodders; 2 percent is credits from the sum of share particpation; and 55 percent is payments in proportion to the recorded weight gain of the livestock. Part of the last amount (up to 20 percent of the balance-sheet profit) is contributed as share particpation to the reserve fund of the enterprise for financing capital investments, replenishment of circulating capital and in case of natural calamities.

During 1973-1977 the interfarm enterprise earned 43 million rubles in profit. Out of this 41.9 million was distributed among the participating farms of the cooperative.

The established interrelations have a positive effect on the economy of the farms and the work of the interfarm enterprise. The majority of kolkhozes and sovkhozes in the cooperative almost completely fulfill the plan for sale of meat to the state owing to the fattening of livestock at the interfarmenterprise and they earn large profits.

Meat Sold to the State
(thous. tons live weight of cattle)

1972	0.4
1973	2.9
1974	2.9
1975	8.3
1976	11.2
1977	13.9

The collective of the Mtsensk Interfarm Enterprise has received awards more than once for raising the effectiveness of production and the quality of work, and for successful fulfillment of the plan. In 1973 they received the second degree Certificate of the USSR All-Union Exhibit of National Economic Achievements (VDNKh), and 32 front-ranking workers in production received medals. In 1976 they received the challenge Red Banner of the CPSU Central Committee, the USSR Council of Ministers, the All-Union Central Council of Trade Unions and the Central Committee of the VLKSM (Komsomol) and a first degree Certificate of the USSR VDNKh. In 1977 they received the challenge Red Banner of the RSFSR Council of Ministers and the All-Union Central Council of Trade Unions.

Many fattening operators overfulfilled their socialist pledges. Last year M.P. Kosenkova, M.A. Kazachenko and V.A. Baranova fattened and turned over to the state 3,694 head of cattle with an average live weight of 413 kilograms, and the average daily weight gain of an animal was 1,084 grams. Almost the same indicators were attained by V.V. Ivanova, D.N. Burmistrova and M.M. Panova.

In order to increase still more the economic effectiveness of beef production, the managers and specialists of the enterprise are working on improving the technology of caring for the livestock, the structure of the ration, and systems of moral and material incentives for the workers and of economic interrelations with the farms.

10908
CSO: 1824

REGIONAL DEVELOPMENT

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SNOW COVER STUDIES FOR RECLAMATION PURPOSES USING LANDSCAPE METHOD

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[Text] The effect generated by snow cover on the development of various natural processes is great and diverse. It reduces the value for the radiation balance of the underlying surface, it lowers the intensity of heat exchange between the lithosphere and the atmosphere, it influences the redistribution of river runoff in terms of time and the development of soil erosion and it creates definite conditions for the vitality of plants and animals. This makes it possible to examine snow cover as an important factor of land reclamation. The observations of a snow cover regime were carried out mainly at posts and stations of the hydrometeorological service. The results of observations conducted over a period of many years, using a single program and processed in accordance with a single method, are of great scientific-practical value, especially for broad geographic generalizations. But the materials obtained from these observations do not make it possible to disclose the role played by snow in individual landscapes or its morphological parts. This is explained by the fact that the selection of tracts for snow tube surveys is based most often upon the nature of their agricultural use. In the process, absolutely no consideration is given to the degree to which they are representative of natural territorial complexes of a definite type and class. Meanwhile, numerous studies have shown that substantial differences exist in the dynamics of a snow cover and not just between large-scale physical-geographic units, but even within the limits of the same landscape and even a natural boundary [2, 3, 4]. The need for using the landscape method for studying snow cover is becoming obvious, since it makes it possible to reveal the peculiarities of its formation, within the limits of the same territory, in a more thorough and comprehensive manner.

We conducted an experiment using such an approach for studying snow cover in the more abundant natural boundaries of the Smolensk lakeland region.

Stationary observations of the snow cover were conducted from 1969 until 1978, with snowtube surveys, air temperature and wind velocity measurements and data on snowstorm phenomena being produced every 10 days.

Within the borders of the lakeland territory, the total amount of solid precipitation fluctuated from 90 to 150 millimeters. A stable snow cover is formed on the average in the middle of December, but for individual years the difference in the dates of its formation may reach 2 months [1]. The disappearance of the stable snow cover, according to average data accumulated over a period of many years, occurs during the first 10 days in April. The duration of the snow cover period during the winter amounts to 125-135 days. A maximum height of snow is observed during the first 10 days in March as a rule, amounting to 27 centimeters on exposed tracts and on protected ones -- 20-30 more centimeters. Of the greatest supplies of water in the snow during the winter, the averages amount to 73-106 km.

The duration of the snow layer and the water supplies change substantially depending upon the overall length of the period with negative temperatures, the amount of precipitation that falls and upon the intensity and duration of the thaws that occur. The nature of a snow cover layer is directly dependent upon the local conditions. In particular, its distribution is greatly influenced by the relief and woody vegetation. Moreover, the surface relief is the principal factor with regard to the distribution of snow on a treeless territory. On reforested territories, the amount of snow is influenced not only by the very presence of the forest but also by its specific composition and age. In view of the fact that the differences in the composition of the wood types are determined mainly by the nature of the underlying rock and the degree of soil dampness, it can be reasoned that on afforested territories, similar to treeless territories, the peculiarities of a snow cover layer will be dependent to a considerable degree upon the geological-geomorphological conditions, assumed by many researchers as the basis for the establishment of PTK's [prirodnyy territorial'nyy kompleks; natural territorial complex]. Thus it is only natural for the differences in the nature of a snow cover layer, for individual PTK's, to be considerable at times. This confirms our observations (see Table 1), presented for the more common natural boundaries of a territory under study and for years which vary in terms of snow content.

Among the natural boundaries covered by forests, the greatest height of snow cover during all of the years was observed in sinkholes found on low and transitional peat bogs. As a rule, however, these PTK's are characterized by lower values for the density of the snow. Thus the maximum water supplies in the snow in this instance are only slightly higher than that for the remaining PTK's, covered by woody vegetation. On the whole and for almost all of the PTK's covered by forests, no great differences were noted in the water supplies in the snow. The only exception was those natural boundaries of morainic plains covered by spruce forests, where the water supplies in the snow were always noticeably lower than in these same or other PTK's, with a different stand of timber involved. This is explained

TABLE 1

Characteristics of Snow Cover for Individual Natural Boundaries During Years of Low (1972), Medium (1978) and Heavy (1977) Snow Conditions

№ п/п (1)	Тип урочища (2)	Год наблюдений (3)	Средние данные основных показателей снежного покрова на период максимальных запасов воды в снеге (4)			Дата схода снега (8)
			высота снега, см (5)	плотность снега, г/см³ (6)	запасы воды в снеге, мм (7)	
1	Пониженная слабоволнистая моренная равнина с дерново-подзолистыми глееватыми суглинистыми почвами под березово-мелколиственным лесом (9)	1972	21	0,27	56,7	7/IV
		1978	57	0,21	119,7	11/IV
		1977	59	0,22	129,8	10/IV
2	Мелкохолмистая моренная равнина с дерново-подзолистыми, дерново-глееватыми суглинистыми почвами под еловым лесом (10)	1972	—	—	—	—
		1978	46	0,23	105,8	18/IV
		1977	43	0,27	116,1	17/IV
3	Моренный холм с дерново-слабоподзолистыми суглинистыми почвами под мелколиственным лесом (11)	1972	19	0,28	53,2	5/IV
		1978	54	0,22	118,8	9/IV
		1977	57	0,22	125,4	10/IV
4	Межхолмовая западина с дерново-глеевыми суглинистыми почвами под кустарником и мелколесьем (12)	1972	26	0,24	62,4	9/IV
		1978	59	0,21	123,9	12/IV
		1977	64	0,21	134,4	
5	Пониженная плоская зандровая равнина с дерново-сильноподзолистыми глееватыми супесчаными почвами под кустарником и мелколесьем (13)	1972	21	0,26	54,6	7/IV
		1978	55	0,21	115,5	11/IV
		1977	58	0,22	127,6	10/IV
6	Низинное болото с мощными и среднемощными торфяными почвами под кустарником и мелколесьем (14)	1972	24	0,25	60,0	8/IV
		1978	61	0,20	122,0	14/IV
		1977	63	0,21	132,3	12/IV
7	Переходное болото с мало- и среднемощными торфяными почвами под березовым лесом (15)	1972	—	—	—	—
		1978	62	0,20	124,0	14/IV
		1977	64	0,21	134,4	12/IV
8	Верховое болото с мощной торфяной почвой под сосновым лесом (16)	1972	23	0,25	57,5	8/IV
		1978	58	0,20	116,0	14/IV
		1977	58	0,22	127,2	10/IV
9	Пониженная слабоволнистая моренная равнина с дерново-подзолистыми глееватыми суглинистыми почвами под злаково-разнотравным лугом (17)	1972	6	0,33	19,8	19/III
		1978	48	0,23	110,4	2/IV
		1977	49	0,25	122,5	3/IV
10	Моренный холм с дерново-слабо- и среднеподзолистыми суглинистыми почвами под полевицево-разнотравным лугом (18)	1972	4	0,36	14,4	16/III
		1978	38	0,27	102,6	31/III
		1977	41	0,26	106,6	29/III
11	Межхолмовая западина с дерново-глеевыми и торфянисто-глеевыми суглинистыми почвами под разнотравно-осоковым лугом (19)	1972	18	0,26	46,8	21/III
		1978	55	0,22	121,0	5/IV
		1977	59	0,22	129,8	5/IV
12	Пониженная плоская зандровая равнина с дерново-подзолистыми глееватыми супесчаными почвами под белоусниково-разнотравным лугом (20)	1972	6	0,31	18,6	18/III
		1978	47	0,23	108,1	3/IV
		1977	45	0,26	117,0	3/IV
13	Низинное болото с мощной торфяной почвой под вейниково-разнотравным лугом (21)	1972	20	0,25	50,0	22/III
		1978	57	0,20	114,0	5/IV
		1977	65	0,20	130,0	6/IV

Key:
1. Item number
2. Type of natural boundary

(Key continued...)

Key (Continued):

3. Year of observations
4. Average data for principal indices of snow cover, for period of maximum water supplies in the snow
5. Height of snow, cm
6. Density of snow, grams per cm^3
7. Water supplies in snow, mm
8. Date of disappearance of snow
9. Low weakly undulating morainic plain with sod-podzolic gleyey loamy soils under a birch and slightly deciduous forest
10. Slightly hilly morainic plain with sod-podzolic, sod-gleyey loamy soils under a brich forest
11. Morainic hill with sod-weakly podzolized loamy soils under a slightly deciduous forest
12. Inter-hill sinkhole with sod-gleyey loamy soils under shrubs and a small forest
13. Low flat outwash plain with sod-strongly podzolic gleyey sandy loam soils under shrubs and a small forest
14. Low-lying bog with deep and medium-deep peat soils under shrubs and a small forest
15. Transitional bog with shallow and medium-deep peat soils under a birch forest
16. High bog with deep peat soil under a pine forest
17. Low weakly-undulating morainic plain with sod-podzolic gleyey loamy soils under a meadow of grasses and mixed herbs
18. Morainic hill with sod-weakly and medium-podzolized loamy soils under a meadow of bentgrass and mixed herbs
19. Inter-hill sinkhole with sod-gleyey and peat-gleyey loamy soils under a meadow of sedge and mixed herbs
20. Low flat outwash plain with sod-podzolic gleyey loamy soils under a meadow of matgrass and various herbs
21. Low-lying bog with deep peat soil under a meadow of reed grass and mixed herbs.

by the fact that in spruce forests a considerable portion of the snow falls on the trees and thereafter is expended in the form of evaporation. In this regard, the snow in a spruce forest is less deep but more dense than in other forests.

Between PTK's having natural grass stands, regardless of the amount of precipitation that falls during the winter, the differences in snow height and density and in the moisture supplies in the snow are always greater than the differences between PTK's having woody vegetation. The least amount of snow accumulates in the case of PTK's characterized by well expressed and positive forms of relief (certainly morainic hills and layers), where the conditions for the disappearance of the snow are more favorable. The greatest amounts of snow were observed in low-lying bogs and inter-hill hollows.

The spatial variability of the principal characteristics of a snow cover is noticeably higher in the case of natural boundaries which lack tree vegetation and undergrowth. Thus the coefficient of variation for the height of snow cover, for a low and weakly undulating morainic plain

occupied by a meadow of grasses and mixed herbs, fluctuates during some years from 16.9 to 88.3, whereas for an area occupied by a small forest at the same PTK, it fluctuated only from 10.1 to 16.7.

The differences in snow height and density and in the water supplies in the snow, between afforested and exposed territories, may change substantially from year to year (see Table 2). During some years (1977, 1978), the differences in the amount of snow accumulating by the end of the winter period in a forest and on exposed territory were negligible and did not exceed 7-10 percent. In the majority of instances, the maximum supplies of snow in a forest were higher by 1.5-2 times or more than that for exposed terrain. Irregularities in the accumulation of snow, in the case of both exposed and reforested PTK's, are associated mainly with thaw conditions. However, a clearly expressed connection between a reduction in the moisture supplies in snow on exposed terrain compared to a reforested area and the number of days involving thaw conditions was not detected. Another principle was observed, however: on an exposed territory and compared to an afforested one, the greater the total amount of positive average daily temperatures during thaw periods, the smaller the amount of snow that accumulates.

The data furnished in Table 2 underscores the fact that the accumulation of snow on an exposed territory is not dependent upon the number of days marked by wind of varying intensities. Wind only increases the irregular nature of snow distribution and does not promote a change in its supplies. However, this applies only to large PTK areas. In the case of individual and small PTK areas, such as morainic hills, kames, gullies and ravines for example, the role played by wind in intensifying the accumulation of snow may be decisive.

Great irregularities in the distribution of snow on exposed terrain are to a large extent the result of human economic activity. The peculiarities of a layer of snow are dependent upon the structure of the agricultural lands, the dimensions of the fields, the soil cultivation methods and so forth. An increase in the degree of economic development of land, associated with the intensive carrying out of land reclamation work and the utilization of newly developed lands for agricultural purposes, can tend to intensify the irregular nature of a layer of snow. This is manifested most noticeably during the continuous destruction on large areas of tree and shrub vegetation and during the construction of an open drainage network. Observations of a snow cover, carried out on an exposed territory of approximately 800 hectares, revealed that on individual tracts of fields located on morainic plains snow may be lacking at times for a considerable portion of the winter period. At the same time, it accumulates along the sides of roads and in populated points.

An intensification of the irregularities in snow layers leads to an increase in the danger of winter-killing of winter crops on raised elements of relief and their perishing under snow on sectors of fields located in low areas,

TABLE 2

Snow Height and Density and Water Supplies in Snow at End of Winter On Reforested and Exposed Tracts of a Low Weakly Undulating Plain, in Connection With Individual Indices of Meteorological Conditions

(1) Название участка	(2) Показатели	(3) Годы наблюдений								
		1969–1970	1970–1971	1971–1972	1972–1973	1973–1974	1974–1975	1975–1976	1976–1977	1977–1978
(4) Залесенный	(5) Высота снега, см	72	54	21	37	42	57	64	59	57
	(6) Плотность снега, г/см³	0,17	0,23	0,27	0,20	0,25	0,22	0,19	0,22	0,21
	(7) Запасы воды в снеге, мм	122,4	124,2	56,7	74,0	105,0	125,4	121,6	129,8	119,7
(8) Открытый	(5) Высота снега, см	27	26	6	18	22	22	21	49	48
	(6) Плотность снега, г/см³	0,30	0,31	0,33	0,29	0,27	0,28	0,23	0,25	0,23
	(7) Запасы воды в снеге, мм	81,0	80,6	19,8	52,2	59,4	61,6	48,3	122,5	110,4
	(9) Количество осадков, мм	129	172	70	80	115	135	130	144	128
	(10) Число дней с оттепелью	7	13	11	13	21	10	11	5	3
	(11) Сумма положительных среднесуточных температур за периоды оттепелей, °С	7,9	7,0	14,7	6,6	12,2	15,7	16,9	3,4	0,9
	(12) Число дней с ветром									
	>5 м/с	44	54	50	34	63	88	81	54	610
	>10 м/с	10	14	10	5	6	38	36	18	3

Key:
1. Type of tract
2. Indices
3. Observation years
4. Reforested
5. Height of snow, cm
6. Density of snow, grams per cm^3
7. Water supplies in snow, mm,
8. Exposed
9. Amount of precipitation, mm
10. Number of days with thaw conditions
11. Total amount of positive average daily temperatures during thaw periods, °C
12. Number of days with wind > 5 meters per second

near roads, forest tracts, buildings and so forth. Thus, when planning drainage and soil improvement land reclamation work for large areas, this circumstance must be taken into account.

When carrying out drainage and soil improvement work on a large scale, measures must also be planned for controlling the duration of the melting of snow. Owing to the fact that snow melts rapidly on open terrain, a noticeable increase occurs during the spring in the maximum flow of samll rivers, streams and mainline, catchments and other canals of a drainage network when the natural vegetation is destroyed.

In accordance with the plan for the regionalization of snow management, proposed by G.D. Rikhter [5], the Smolensk lakeland region is included in

the zone in which such reclamation is required mainly during years marked by large amounts of snow, for the purpose of combating the damping and drenching of winter crops. A similar conclusion was drawn by A.M. Shul'gin [6]. For the majority of natural boundaries in the lakeland region, such an approach, in connection with snow management and for the purpose of normal wintering for the agricultural crops, should be considered to be correct. However for a number of PTK's and particularly in connection with soil improvement and drainage work, snow management operations must be carried out practically annually. This applies primarily to the draining of low-lying peat bogs and especially to the reclamation canals of an exposed network. Our observations have shown that an exposed network of canals, with a distance between the driers of 90-100 meters, is capable, in connection with the drifting of snow and thaws, of accumulating snow by the end of the winter period in an amount equal to 30-60 percent of the overall supplies of snow on a peat bog. As a result, snow may be lacking completely in various areas on the fields of a drained bog for a considerable portion of the winter period. In addition to deep freezing of the peat, this also promotes wind erosion of the soil if the peat bog is used for cultivated crops.

TABLE 3

Snow Height and Density and Water Supplies in Snow at the End of the Winter Period, on Virgin Land and Drained Tracts of a Flood-Plain Marsh

Название участка (1)	Показатели (2)	(3) Годы наблюдений						
		1970	1973	1974	1975	1976	1977	1978
Целинное болото (4)	высота снега, см (5)	55	31	40	43	37	65	57
	плотность снега, г/см³ (6)	0,22	0,24	0,26	0,29	0,20	0,20	0,20
	запасы воды в снеге, мм (7)	121,0	74,4	104,0	124,7	74,0	130,0	114,0
Осушаемое (8) болото	высота снега, см (5)	21	15	16	15	19	36	43
	плотность снега, г/см³ (6)	0,28	0,30	0,18	0,29	0,18	0,29	0,21
	запасы воды в снеге, мм (7)	58,0	45,0	28,8	43,5	34,2	104,4	90,3

Key:
1. Type of tract
2. Indices
3. Observation years
4. Virgin land bog
5. Height of snow, cm
6. Density of snow, grams per cm^3
7. Water supplies in snow, mm
8. Drained bog

On the fields of a drained peat bog, 1.5-3 times less snow usually accumulates than that which collects on virgin land bogs (see Table 3). As a result and following drainage of the bogs, a noticeable increase takes place in the depth of freezing of the peat. In those instances where the peat freezes to a depth greater than 50 cm, its complete thawing out, owing to low thermal and temperature conductivity, occurs during the second half of June and even at times in July. The presence of a frozen layer restrains

the warming of the peat bog. Thus, following a winter marked by a small amount of snow on a bog, even the upper layer of peat is noticeably colder than the mineral soil during the summer. In those instances where a great amount of snow accumulates on a bog, the freezing of the peat is not very great and its upper layer may be warmer than the mineral soil throughout a large portion of the summer period (see Table 4).

During years marked by a small amount of snow on the fields of drained bogs, the temperature of the upper layer of peat soil is considerably lower than the mineral soil even during the winter period. During particular and colder periods of the winter, the differences in temperature between the mineral and peat soil, at the tillering node depth, may reach 10° or more. Low peat temperatures during the winter period cause freezing of the winter crops and at times the grasses as well.

TABLE 4

Average Monthly Soil Temperatures at a Depth of 10 cm On a Drained Peat Bog and in a Dry Valley, Following Winters Marked By Low (1976) and Considerable (1977) Quantities of Snow on the Fields

Год наблюдений (1)	Название объекта (2)	Максимальная за зиму глубина промерзания, см (3)	(4) Средняя температура почвы, °С				
			май (5)	июнь (6)	июль (7)	август (8)	сентябрь (9)
1976	осушаемый торфяник под многолетними травами (10)	62	4,5	11,4	15,5	13,8	11,0
	суходол, естественный луг (11)	115	8,4	13,3	16,1	14,6	10,9
1977	осушаемый торфяник под многолетними травами (10)	30	11,9	16,0	17,4	15,4	10,4
	суходол, естественный луг (11)	65	11,5	14,8	16,6	15,0	10,5

Key:
1. Year of observations
2. Type of arrangement
3. Maximum depth of freezing during winter, cm
4. Average soil temperature, °C
5. May
6. June
7. July
8. August
9. September
10. Drained peat bog occupied by perennial grasses
11. Dry valley, natural meadow

It is apparent that an accumulation of snow on the fields of drained bogs can improve substantially the living conditions for plants. However, almost no snow management work is being carried out on drained peat bogs. Nor are any recommendations available for the carrying out of such reclamation work. Literary data and also our observations on the influence generated by individual flower-beds, forest strips or shrubs on the redistribution of

snow reveal that individual forest strips or shrubs planted along canals, on their windward side, can be used for controlling snow cover on peat bogs drained by an exposed network of canals. Forest strips positioned perpendicular to the direction of movement of the prevailing winds during the winter are considered to be advisable for peat bogs drained by means of closed drainage. Other snow management methods can be used for controlling snow cover on peat bogs: use of screens, planting of windbreak plants, plowing of snow and so forth..

Snow management is also required for some other PTK's. Thus, inside a peripheral glaciation strip, when draining the natural boundaries of low-lying weakly-undulating morainic plains and inter-hill hollows, afforestation should be carried out on morainic hills and kames in order to achieve more uniform snow distribution. Snow distribution is favorably influenced by the presence of woody vegetation on the raised tracts of large morainic hills and on elevated morainic plains. On all of these PTK's, tree plantings promote not only a more uniform distribution of snow on the surface but also a noticeable reduction in soil erosion, improvements in the microclimate of fields and the creation of favorable conditions for many useful birds and a more attractive landscape.

In a number of PTK's, snow management should be carried out only during certain years. Thus, on winter crop fields, when the snow falls directly on such land and achieves a considerable depth, snow accumulation should be employed on a PTK having low-lying elements of relief in order to increase its thermal conductivity. On elevated morainic plains and large morainic hills, measures are often required for increasing the length of time that the snow remains on the ground, since winter crops often perish on these PTK's owing to low temperatures during the early spring periods.

The materials furnished above reveal that the landscope approach makes it possible to study in detail the peculiarities involved in the formation of snow cover on a territory and also to ascertain the requirements with regard to carrying out snow management on the territory. For the purpose of determining the most effective measures for controlling snow, such an approach makes it possible, with minimal expenditures, to organize stationary studies and to use the results of such studies in the correct manner.

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